



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2005SC15B

Title: Environmental Predictors of Mercury Methylation Potential and Fish Tissue

Project Type: Research

Focus Categories: Toxic Substances, Hydrogeochemistry, Models

Keywords: Mercury, Methylmercury, Bioaccumulation, Fish Consumption Advisories, Dissolved Organic Matter, Photochemistry, Biogeochemistry, Spatial Analysis, Geographic Information Systems, Statistical Models

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Non-Federal Matching Funds: \$51,958

Congressional District: 3rd

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Abstract

Mercury contamination in freshwater fish has emerged as an important environmental problem at a national scale. Mercury contamination is responsible for 80% of the fish consumption advisories issued in the United States. In South Carolina, the Department of Health and Environmental Control has issued consumption advisories for fish from at least 50 lakes, reservoirs, streams, and rivers—almost all of these are due to mercury. It is evident that much of the problem is concentrated in rivers of the coastal plain, colloquially known as "blackwater" rivers, due their high concentration of dissolved organic matter (DOM). The health risks associated with the widespread contamination of fish by mercury are substantial, particularly for vulnerable sub-populations including children, infants, and pregnant women.

The goal of the proposed research is to develop a better understanding of the underlying biotic and abiotic processes that form methylmercury (the most bioavailable form of mercury) in blackwater ecosystems, and the resulting bioaccumulation in fish. We propose to focus on key biotic and abiotic processes in water and sediments of the Edisto River, South Carolina, in the presence of high DOM concentrations typical of blackwater rivers of the southeastern coastal plain. Laboratory studies will determine mercury methylation potentials via biotic and abiotic pathways in water and sediments samples from several locations along the Edisto River. Geographic Information Systems (GIS) will be used to compile spatial data regarding water chemistry, mercury sources and deposition, and landscape characteristics surrounding each sampling site. Statistical models, using quantile regression and classification and regression trees (CART), will be used to develop predictive relationships between environmental variables and the observed mercury methylation potentials and fish tissue concentrations of mercury at sampling locations within the Edisto River. The proposed work should lead to better tools and methods methylation potential or fish tissue concentration to surrounding landscape characteristics would be valuable to the South Carolina Department of Health and Environmental Control, and other, because it would provide a means of extrapolation or existing monitoring data to other rivers and streams that are not currently samples.